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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/636,021
Filing Date: August 06, 2003
Appellant(s): PALSULICH ET AL.

Chen Liang
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 03/30/2008 appealing from the Office action mailed 10/17/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6054373	TOMITA	04-2000
5762755	McNEILLY	60-1998

6399517 YOKOMIZO 06-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-9, 11-17, 19-27, 49, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al. (U.S. Patent No. 6,054,373), in view of McNeilly et al. (U.S. Patent No. 5,762,755).

As to claim 1, Tomita discloses a method of processing a microfeature workpiece, comprising: supporting a microfeature workpiece (23) by an unheated support (22) in an interior of a processing chamber (21) (column 7, lines 57-61; Figure 5); contacting a surface of the microfeature workpiece (23) with an etchant liquid (column 7, lines 65-67; column 8, lines 1-2); heating the etchant liquid by delivering radiation from a radiation source (24) through the wall of the processing chamber to heat the etchant liquid (column 4, lines 18-22); controlling the radiation source to maintain a temperature of the etchant liquid at or above a target process temperature to etch the surface of the microfeature workpiece (column 8, lines 3-9). Although Tomita does not expressly disclose the step of removing the etched microfeature workpiece (23) from the processing chamber (21), this step is inherently present in the process.

1. Tomita does not expressly disclose a chamber having a polymeric wall; and the polymeric wall of the processing chamber being substantially non-reactive with the etchant liquid. However, Tomita discloses directing an external infrared heater (24) to heat a microfeature workpiece (23) (column 7, lines 62-62), contained in a quartz

processing chamber (21) (column 7, line 59; Figure 5). Moreover, the microfeature workpiece (23) is immersed in either sulfuric or phosphoric acid (column 7, lines 65-57; column 8, lines 1-2, lines 25-27). McNeilly teaches the general concept of using a fluoropolymer material in a vapor etching chamber (2) (column 10, lines 25-30; Figure 1) as a suitable material when both corrosion resistance (column 12, lines 42-44) and transparency to infrared wavelengths are required (column 12, lines 44-46). McNeilly also teaches the use of fluoropolymer-coated quartz in etching chambers (column 13, lines 6-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a chamber having a polymeric wall, such as a fluoropolymer. One who is skilled in the art would be motivated to use a polymeric wall, such as a fluoropolymer, which is both resistant to etching chemicals and transparent to infrared radiation. Moreover, because McNeilly teaches that the fluoropolymer is corrosion resistant (column 12, lines 42-44), the characteristic of the polymeric wall of the processing chamber being substantially non-reactive with the etchant liquid would naturally be encompassed.

Tomita does not expressly disclose delivering radiation through the polymeric wall; and the polymeric wall being more transmissive of an operative wavelength range of the radiation than the etchant liquid, thereby a temperature of the etchant liquid is increased more rapidly than a temperature of the polyermic wall. However, Tomita discloses heating the etchant liquid by delivering radiation from a radiation source (24) through the wall of the processing chamber to heat the etchant liquid (column 4, lines 18-22). McNeilly teaches or suggests a chamber with a polymeric wall (column 12,

lines 42-46). McNeilly further teaches that the polymeric wall, a fluoropolymer, is transparent to infrared radiation (column 12, lines 44-46). Thus, by performing the steps of the combined teachings, delivering radiation through the polymeric wall would naturally be encompassed. Furthermore, the characteristic of the polymeric wall being more transmissive of an operative wavelength range of the radiation than the etchant liquid, thereby a temperature of the etchant liquid is increased more rapidly than a temperature of the polyermic wall, would also be naturally encompassed.

As to claim 2, Tomita discloses adding the etchant liquid to the processing space at a first temperature that is below the target process temperature (column 4, lines 59-63).

As to claim 3, Tomita discloses that the radiation is delivered substantially uniformly across the surface of the microfeature workpiece (23) (column 7, lines 62-64; column 8, lines 3-9).

As to claim 4, Tomita discloses that the radiation comprises infrared radiation (column 7, lines 57-61).

As to claim 5, Tomita discloses enclosing the microfeature workpiece (23) within the interior of the processing chamber (21) (column 7, lines 57-61; Figure 5).

As to claim 6, Tomita discloses that a temperature of the wall of the processing chamber is no greater than the temperature of the etchant liquid when the etchant liquid is at or above the target process temperature (column 7, lines 62-64, lines 65-67; column 8, lines 1-2). The infrared heater (24) is directed at heating microfeature

workpiece (23) (column 7, lines 62-62), rather than the quartz walls of processing chamber (21) (column 7, line 59).

As to claim 7, Tomita discloses that processing chamber includes a base (22), a temperature of the base of the processing chamber being no greater than the temperature of the etchant liquid when the etchant liquid is at or above the target process temperature (column 7, lines 62-64, lines 65-67; column 8, lines 1-2). The infrared heater (24) is directed at heating microfeature workpiece (23) (column 7, lines 62-62), rather than the quartz base (22) (column 7, line 60).

As to claim 8, Tomita discloses that the radiation is substantially the only heat source for heating the etchant liquid from a first temperature to the target process temperature, which is higher than the first temperature (column 7, lines 62-64). The microfeature workpiece (23) is heated by the infrared heater (24), resulting in the conductive heating of the etchant liquid (column 7, lines 62-64).

As to claim 9, Tomita does not expressly disclose an inner surface of the processing chamber comprises a fluoropolymer, further comprising contacting the inner surface of the processing chamber with the etchant liquid. However, Tomita discloses directing an external infrared heater (24) to heat a microfeature workpiece (23) (column 7, lines 62-62), contained in a quartz processing chamber (21) (column 7, line 59; Figure 5). Moreover, the microfeature workpiece (23) is immersed in either sulfuric or phosphoric acid (column 7, lines 65-57; column 8, lines 1-2, lines 25-27). McNeilly teaches the general concept of using a fluoropolymer material in a vapor etching chamber (2) (column 10, lines 25-30; Figure 1) as a suitable material when both

corrosion resistance (column 12, lines 42-44) and transparency to infrared wavelengths are required (column 12, lines 44-46). McNeilly also teaches the use of fluoropolymer-coated quartz in etching chambers (column 13, lines 6-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the inner surface of the processing chamber comprises a fluoropolymer, further comprising contacting the inner surface of the processing chamber with the etchant liquid. One who is skilled in the art would be motivated to use a material, such as a fluoropolymer, which is both resistant to etching chemicals and transparent to infrared radiation.

As to claims 11, Tomita discloses a method of processing a microfeature workpiece comprising: positioning a microfeature workpiece (23) on an unheated support (22) in an interior of a processing chamber (21) (column 7, lines 57-61; Figure 5); enclosing the microfeature workpiece (23) within the interior of the processing chamber (21) (Figure 5); contacting a surface of the microfeature workpiece (23) with an etchant liquid at a first temperature (column 7, lines 62-64); heating the etchant liquid from the first temperature to a second temperature using an infrared heat source (24) positioned entirely outside the enclosed processing chamber (21), the second temperature being higher than the first temperature (column 7, lines 62-64), and the second temperature promoting etching of a surface of the microfeature workpiece (column 5, lines 49-61); and etching the surface of the microfeature workpiece with the etchant liquid at or above the second temperature (column 5, lines 49-61).

Tomita does not expressly disclose a processing chamber having a polymeric wall with an inner surface; and the etchant liquid being substantially non-reactive with the inner surface of the processing chamber. However, Tomita discloses directing an external infrared heater (24) to heat a microfeature workpiece (23) (column 7, lines 62-62), contained in a quartz processing chamber (21) (column 7, line 59; Figure 5). Moreover, the microfeature workpiece (23) is immersed in either sulfuric or phosphoric acid (column 7, lines 65-57; column 8, lines 1-2, lines 25-27). McNeilly teaches the general concept of using a fluoropolymer material in a vapor etching chamber (2) (column 10, lines 25-30; Figure 1) as a suitable material when both corrosion resistance (column 12, lines 42-44) and transparency to infrared wavelengths are required (column 12, lines 44-46). McNeilly also teaches the use of fluoropolymer-coated quartz in etching chambers (column 13, lines 6-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a polymeric wall with an inner surface. One who is skilled in the art would be motivated to use a material, such as a fluoropolymer, which is both resistant to etching chemicals and transparent to infrared radiation. Moreover, because McNeilly teaches that the fluoropolymer is corrosion resistant (column 12, lines 42-44), the characteristic of the etchant liquid being substantially non-reactive with the inner surface of the processing chamber, would naturally be encompassed.

Tomita does not expressly disclose heating the etchant liquid through the polymeric wall; and etchant liquid being more absorptive of radiation from the infrared heat source than the polymeric wall, thereby the etchant liquid is heated more rapidly

than the polymeric wall of the processing chamber. However, Tomita discloses heating the etchant liquid by delivering radiation from a radiation source (24) through the wall of the processing chamber to heat the etchant liquid (column 4, lines 18-22). McNeilly teaches or suggests a chamber with a polymeric wall (column 12, lines 42-46). McNeilly further teaches that the polymeric wall, a fluoropolymer, is transparent to infrared radiation (column 12, lines 44-46). Thus, by performing the steps of the combined teachings, heating the etchant liquid through the polymeric wall, would naturally be encompassed. Furthermore, the characteristic of the etchant liquid being more absorptive of radiation from the infrared heat source than the polymeric wall, thereby the etchant liquid is heated more rapidly than the polymeric wall of the processing chamber, would also be naturally encompassed.

Moreover, Tomita discloses that the microfeature workpiece (23) is silicon (column 7, line 62), immersed in phosphoric acid (column 8, lines 25-27), heated to a temperature between 150°C to 300°C (Figure 3). Yokomizo (U.S. Patent No. 6,399,517), cited to support inherency, teaches that exposure of silicon to phosphoric acid at a temperature range of 160°C to 180°C results in silicon etching (column 1, lines 13-24). Therefore, the steps of promoting etching of a surface of the microfeature workpiece at the second temperature; and etching the surface of the microfeature workpiece with the etchant liquid at or above the second temperature are inherently accomplished by Tomita's method.

As to claim 12, Tomita discloses that the radiation is delivered substantially uniformly across the surface of the microfeature workpiece (column 7, lines 62-64).

As to claim 13, Tomita discloses that the infrared radiation comprises near infrared radiation (column 7, lines 56-58). Tomita's disclosure of infrared radiation is presumed to encompass all wavelengths of the infrared spectrum, including near infrared radiation.

As to claim 14, Tomita discloses that a temperature of the wall of the processing chamber is no greater than the temperature of the etchant liquid when the etchant liquid is at or above the target process temperature (column 7, lines 62-64, lines 65-67; column 8, lines 1-2). The infrared heater (24) is directed at heating microfeature workpiece (23) (column 7, lines 62-62), rather than the quartz walls of processing chamber (21) (column 7, line 59).

As to claim 15, Tomita discloses that the processing chamber includes a base (22), a temperature of the base of the processing chamber being no greater than the temperature of the etchant liquid when the etchant liquid is at or above the second temperature (column 7, lines 62-64, lines 65-67; column 8, lines 1-2). The infrared heater (24) is directed at heating microfeature workpiece (23) (column 7, lines 62-62), rather than the quartz base (22) (column 7, line 60).

As to claim 16, Tomita discloses that the infrared radiation is substantially the only heat source for heating the etchant liquid from the first temperature to the second temperature (column 7, lines 65-67; column 8, lines 1-2).

As to claim 17, Tomita does not expressly disclose that the inner surface of the processing chamber comprises a fluoropolymer, further comprising contacting the inner surface of the processing chamber with the etchant liquid. However, Tomita discloses

directing an external infrared heater (24) to heat a microfeature workpiece (23) (column 7, lines 62-62), contained in a quartz processing chamber (21) (column 7, line 59; Figure 5). Moreover, the microfeature workpiece (23) is immersed in either sulfuric or phosphoric acid (column 7, lines 65-57; column 8, lines 1-2, lines 25-27). McNeilly teaches the general concept of using a fluoropolymer material in a vapor etching chamber (2) (column 10, lines 25-30; Figure 1) as a suitable material when both corrosion resistance (column 12, lines 42-44) and transparency to infrared wavelengths are required (column 12, lines 44-46). McNeilly also teaches the use of fluoropolymer-coated quartz in etching chambers (column 13, lines 6-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form inner surface of the processing chamber with a fluoropolymer, further comprising contacting the inner surface of the processing chamber with the etchant liquid. One who is skilled in the art would be motivated to use a material, such as a fluoropolymer, which is both resistant to etching chemicals and transparent to infrared radiation.

As to claim 19, Tomita discloses a method of processing a microfeature workpiece, comprising: supporting a microfeature workpiece (23) with an unheated support (22) in an interior of a processing chamber (23) (column 7, lines 57-61; Figure 5); contacting a surface of the microfeature workpiece (23) with a processing fluid (column 7, lines 65-67; column 8, lines 1-2; Figure 5); delivering infrared radiation through the wall of the processing chamber to heat the processing fluid from a first temperature to a higher second temperature that promotes processing of the surface of the microfeature workpiece (column 7, lines 62-67; column 8, lines 1-2); and

maintaining a temperature of the processing fluid at or above the second temperature for a process period to process the surface of the microfeature workpiece (23) (column 8, lines 3-9), a temperature of the wall of the processing chamber being no greater than the temperature of the processing fluid during the process period (column 7, lines 62-64, lines 65-67; column 8, lines 1-2).

Tomita does not expressly disclose a processing chamber having a polymeric wall. However, Tomita discloses directing an external infrared heater (24) to heat a microfeature workpiece (23) (column 7, lines 62-62), contained in a quartz processing chamber (21) (column 7, line 59; Figure 5). Moreover, the microfeature workpiece (23) is immersed in either sulfuric or phosphoric acid (column 7, lines 65-57; column 8, lines 1-2, lines 25-27). McNeilly teaches the general concept of using a fluoropolymer material in a vapor etching chamber (2) (column 10, lines 25-30; Figure 1) as a suitable material when both corrosion resistance (column 12, lines 42-44) and transparency to infrared wavelengths are required (column 12, lines 44-46). McNeilly also teaches the use of fluoropolymer-coated quartz in etching chambers (column 13, lines 6-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a polymeric wall with an inner surface. One who is skilled in the art would be motivated to use a material, such as a fluoropolymer, which is both resistant to etching chemicals and transparent to infrared radiation.

Tomita does not expressly disclose delivering radiation through the polymeric wall; and the polymeric wall being more infrared transparent than the processing fluid, thereby the processing fluid is heated more rapidly than the polymeric wall. However,

Tomita discloses heating the etchant liquid by delivering radiation from a radiation source (24) through the wall of the processing chamber to heat the etchant liquid (column 4, lines 18-22). McNeilly teaches or suggests a chamber with a polymeric wall (column 12, lines 42-46). McNeilly further teaches that the polymeric wall, a fluoropolymer, is transparent to infrared radiation (column 12, lines 44-46). Thus, by performing the steps of the combined teachings, delivering radiation through the polymeric wall would naturally be encompassed. Furthermore, the characteristic of the polymeric wall being more infrared transparent than the processing fluid, thereby the processing fluid is heated more rapidly than the polymeric wall, would also be naturally encompassed.

As to claim 20, Tomita does not expressly disclose the processing fluid comprises an etchant liquid and processing the surface of the microfeature workpiece comprises etching the surface of the microfeature workpiece. However, Tomita discloses the microfeature workpiece (23) is silicon (column 7, line 62), immersed in phosphoric acid (column 8, lines 25-27), heated to a temperature between 150°C to 300°C (Figure 3). Yokomizo (U.S. Patent No. 6,399,517), cited to support inherency, teaches that exposure of silicon to phosphoric acid at a temperature range of 160°C to 180°C results in silicon etching (column 1, lines 13-24). Therefore, processing fluid is inherently an etchant liquid and the step of processing the surface of the microfeature workpiece comprises etching the surface of the microfeature workpiece is inherently accomplished by Tomita's method.

As to claim 21, Tomita does not expressly disclose that an inner surface of the processing chamber comprises a fluoropolymer, further comprising contacting the inner surface of the processing chamber with the etchant liquid. However, Tomita discloses directing an external infrared heater (24) to heat a microfeature workpiece (23) (column 7, lines 62-62), contained in a quartz processing chamber (21) (column 7, line 59; Figure 5). Moreover, the microfeature workpiece (23) is immersed in either sulfuric or phosphoric acid (column 7, lines 65-57; column 8, lines 1-2, lines 25-27). McNeilly teaches the general concept of using a fluoropolymer material in a vapor etching chamber (2) (column 10, lines 25-30; Figure 1) as a suitable material when both corrosion resistance (column 12, lines 42-44) and transparency to infrared wavelengths are required (column 12, lines 44-46). McNeilly also teaches the use of fluoropolymer-coated quartz in etching chambers (column 13, lines 6-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the inner surface of the processing chamber comprising a fluoropolymer, further comprising contacting the inner surface of the processing chamber with the etchant liquid. One who is skilled in the art would be motivated to use a material, such as a fluoropolymer, which is both resistant to etching chemicals and transparent to infrared radiation.

As to claim 22, Tomita discloses adding the processing fluid to the processing space at an introduction temperature that is below the second temperature (column 4, lines 59-63).

As to claim 23, Tomita discloses adding the processing fluid to the processing space at the first temperature that is below the second temperature (column 4, lines 59-63).

As to claim 24, Tomita discloses that the radiation is delivered substantially uniformly across the surface of the microfeature workpiece (23) (column 7, lines 62-64; column 8, lines 3-9).

As to claim 25, Tomita discloses that the radiation comprises infrared radiation (column 7, lines 57-61).

As to claim 26, Tomita discloses enclosing the microfeature workpiece (23) within the interior of the processing chamber (21) (column 7, lines 57-61; Figure 5).

As to claim 27, Tomita discloses that the radiation is substantially the only heat source for heating the processing fluid from the first temperature to the second temperature (column 7, lines 62-64).

As to claims 49-56, Tomita discloses "According to a first aspect of the present invention, there is provided a method of supplying a chemical agent to the surface of a semiconductor substrate and simultaneously heating the semiconductor substrate to release and rediffuse metallic impurities in the semiconductor substrate to allow them to move to the surface of the semiconductor substrate, thereby dissolving them with the chemical agent to remove them" (column 1, line 63). Clearly Tomita teaches heating the substrate/chemical-agent faster than the container walls since the container walls are transparent to the radiation otherwise the radiation would not heat the substrate, which reads on appellant's limitation of "increasing a temperature of the etchant liquid more

rapidly than a temperature of the polymeric wall by delivering radiation to the etchant liquid from a radiation source and through the polymeric wall of the processing chamber" Tomita heats both substrate and chemical agent with radiation heating, if the chemical agent absorbs the radiation more than the substrate the chemical agent will heat faster than the substrate and certainly more that the container walls since the container walls are transparent to the radiation meaning they do not absorb radiation and therefor cannot be heated directly by the radiation.

Claims 10, 18, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita in view of Yokomizo et al. (U.S. Patent No. 6,399,517).

As to claims 10, 18, and 28, Tomita does not expressly disclose etching the surface of the microfeature workpiece yields a resultant etchant, the method further comprising determining at least one chemical property of the microfeature workpiece by chemically analyzing the resultant etchant. However, Tomita discloses that the silicon microfeature workpiece (23) is silicon (column 7, line 62) and immersed in phosphoric acid (column 8, lines 25-27). Yokomizo teaches that when etching silicon with a phosphate etchant, the concentration of silicon in the phosphate increases, and that the solution must be periodically changed (column 1, lines 34-40). Yokomizo discloses a processing chamber (10) for etching microfeature workpiece (W) in etchant liquid (E), which contains a concentration sensor (50) (column 4, lines 54-59) to detect silicon concentration in the etchant liquid (column 7, lines 15-22). Moreover, when the silicon concentration reaches a predetermined level, this signal can either terminate the

etching process (column 7, lines 15-22) or trigger replacement of the etchant liquid (column 7, lines 43-50). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the step of determining at least one chemical property of the microfeature workpiece by chemically analyzing the resultant etchant. One who is skilled the art would be motivated to determine the completion of the etching process or to determine when the etchant liquid should be replenished.

(10) Response to Argument

Claims 1-5, 8, 9, 11-13, 16 and 17.

Regarding appellant's argument stating "One of ordinary skill in the art would not modify Tomita's cleaning apparatus as suggested by the Examiner because, among other reasons, modifying Tomita's beaker to be constructed with McNeilly's polymeric material would likely render Tomita's process unsatisfactory for its intended purpose. Tomita discloses etching a silicon substrate at a temperature of at least 200°C and as high as possible. (Tomita at column 7, lines 33-36). In one example, the highest treatment temperature can be about 290°C to 350°C when sulfuric acid is used. (Tomita at column 5, lines 62-65). If McNeilly's polymeric material (e.g., Teflon® AF and FEP) is used to form Tomita's beaker, Tomita's etching temperature could not be as high as just below the boiling point of the liquid because the service temperature of McNeilly's polymeric material restricts operating temperature of Tomita's beaker. For example, continuous exposure of FEP to temperatures above 200°C is not recommended

according to Perry's Chemical Engineers' Handbook, 5th Edition, at 23-51 (Robert H. Perry ed., 1984)" (page 11). This argument is not persuasive because, first , regarding appellant's arguments about the temperature characteristics of Teflon FEP obtained in Perry's Chemical Engineering Handbook, the examiner respectfully notes that the arguments are not persuasive because McNeilly's cited polymeric materials include Teflon AF and FEP, out of those two recommended Teflon materials the appellant chose the FEP Teflon for illustrating his argument. The examiner notes that Teflon AF has a higher upper use temperature than Teflon FEP. Second, Tomita does not restrict the operating temperature to any specific value, in column 5, line 61, Tomita cites "The highest treatment temperature in the case of the chemical agent is about 290.degree. C. to 350.degree. C. for sulfuric acid and fluoric-acid-added sulfuric acid and 213.degree. C. for fluoric-acid-added phosphoric acid.", Tomita does not teach the temperature has to be about 290.degree. C. to 350.degree, in the same sentence Tomita teaches 213.degree. C. for fluoric-acid-added phosphoric acid.

Clearly Tomita teaches other embodiments where the temperature does not need to be as high as the appellant's selected temperatures. For example in figure 3, Tokima clearly suggests the residual copper removal process is still effective at lower temperature than 300 degree c. only with a lower removal rate. In figure 3, Tomita shows (in a logarithmic scale) that the difference between a 200 degree C treatment and 300 degree C treatment, the difference in the Cu residual rate (%)changes from about 13 % about to about 3 %, and increasing the cleaning time lowers the residual

rate. Lowering the temperature to 200 degree C. does not render the process ineffective.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to consider the effect of the solution temperature on the apparatus walls and select the proper temperature that would be both, effective for the cleaning/etching process, and, insures the apparatus walls are not deteriorated by the selected solution temperature. It would have been obvious to one of ordinary skill in the art at the time the invention was made to lower the operating temperature to be within the recommended range of Teflon used.

In addition, one of ordinary skill in the art would be motivated to select a less preferred embodiment, namely a temperature lower than the maximum temperature suggested by McNeilly, in order to prevent a rapid deterioration of the apparatus, when the maximum temperature will result in harming the apparatus.

Regarding appellant's arguments about Tomita attempting to avoid external cooling because the beaker already can handle high etching temperature. The examiner respectfully notes that the provided motivation to combine McNeilly to Tomita is to obtain better resistance to etching due to the non-reactive nature of Teflon. McNeilly covers only the inner surface of the exposed quartz with Teflon. McNeilly does not suggest replacing quartz with Teflon.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Tomita to take into account any design consideration when the Teflon is added to the chamber walls, including better or

no cooling. One of ordinary skill in the art would have been motivated to include cooling when the operating temperature in the modified beaker exceeds the limit of temperature stability of the materials used for the Teflon containing modified beaker.

As to appellant's argument about McNeilly "does not teach using a polymeric material alone", the examiner respectfully notes that this argument is not commensurate with the scope of appellant's claim 1. Claim 1 cites "a processing chamber having polymeric wall" a polymeric material "alone" as the chamber wall is not claimed by the appellant. The possibility of a wall lined with a polymeric material, as proposed by McNeilly, certainly reads on appellant's claim, since such a wall would be, at least partially, polymeric.

Claims 6, 7, 14, 15 and 19-27.

Regarding appellant's arguments about the cited references do not teach the temperature of the walls is no grater than the temperature of the liquid, the examiner respectfully notes that this argument is not persuasive because, in (column 7, lines 56-67) , Tomita clearly discloses the liquid is not heated by the walls of the beaker but rather the liquid in contact with the substrate (wafer) is heated by the infrared radiation absorbed by the substrate. Tomita uses a quartz beaker, quartz is transparent to infrared, if quartz was not transparent to infrared radiation, then the walls of the beaker will be heated more rapidly than the substrate, heating of the substrate is allowed only when the infrared radiation travels through the transparent quartz walls without being absorbed, in order to effectively heat the substrate. The liquid of Tomita is heated

through the infrared radiation absorbed by the substrate, not the infrared radiation absorbed by the beaker quartz walls. Tomita never even suggests the substrate is heated by the beaker wall temperature. McNeilly teaches the general concept of using a fluoropolymer material in a vapor etching chamber (2) (column 10, lines 25-30; Figure 1) as a suitable material when both corrosion resistance (column 12, lines 42-44) and transparency to infrared wavelengths are required (column 12, lines 44-46). McNeilly also teaches the use of fluoropolymer-coated quartz in etching chambers (column 13, lines 6-11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to expect the infrared transparent fluoropolymer-coated quartz to transmit the heating infrared energy to the substrate/liquid interface as suggested by Tomita. Since the fluoropolymer-coated quartz is transparent to the heating infrared, it would have been obvious to one of ordinary skill in the art at the time the invention was made to expect the fluoropolymer-coated quartz to remain at a lower temperature relative to the more absorbing substrate/liquid interface.

Claims 49-56

As to appellant's argument about the fact that the references of record do not suggest "increasing a temperature of the etchant liquid more rapidly than the temperature of the polymeric wall", this argument is not persuasive because in the method of Tomita modified by McNeilly, both quartz and Teflon AF are transparent to UV as suggested by McNeilly. McNeilly cites "A two window assembly is used to assure strength and to

allow lower window 8 to be formed from a corrosion resistant material. Highly corrosive materials such as HF vapor used for wafer etching require the use of a window material which will not degrade. Additionally, any material used in window assembly 9 must necessarily allow the desired UV and IR wavelengths to pass." (column 12, lines 40-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to understand that if the infrared radiation "passes" through the window without being absorbed by the window, and to understand that, if a more absorbing surface such as silicon is exposed through the transparent window, the silicon will be heated more rapidly than transparent window, this is the basic concept of the term "transparent". Since the liquid of Tomita is heated by the infrared heated wafer, then, it would have been obvious to one of ordinary skill in the art at the time the invention was made to expect the liquid in contact with the wafer to be heated more rapidly than the infrared transparent window.

Claims 10, 18 and 28.

Note: In section VII (B.) (page 15) the appellant grouped claims 10, 20 and 28. The examiner notes that the appellant intended grouping claims 10, 18 and 28, and the examiner responds accordingly.

Regarding appellant's argument stating "One of ordinary skill in the art would not modify Tomita's system as suggested by the Examiner because Tomita teaches away from being modified to come up with the arrangement of this claim as described above with reference to Group I.", this argument has been treated above.

As to appellant's argument stating " Yokomizo fails to cure the deficiencies of Tomita. Specifically, Yokomizo does not disclose or suggest a processing chamber having a polymeric wall". As suggested in the office action, the reference of Yokomizo is not relied on to teach polymeric walls because McNeilly does that, but rather Yokomizo is relied on to teach that when etching silicon with a phosphate etchant, the concentration of silicon in the phosphate increases, and that the solution must be periodically changed (column 1, lines 34-40). Yokomizo discloses a processing chamber (10) for etching microfeature workpiece (W) in etchant liquid (E), which contains a concentration sensor (50) (column 4, lines 54-59) to detect silicon concentration in the etchant liquid (column 7, lines 15-22). Moreover, when the silicon concentration reaches a predetermined level, this signal can either terminate the etching process (column 7, lines 15-22) or trigger replacement of the etchant liquid (column 7, lines 43-50).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Mahmoud Dahimene/

Examiner, Art Unit 1792

Conferees:

/Nadine G Norton/

Supervisory Patent Examiner, Art Unit 1792

/Christopher A. Fiorilla/

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